

Introduction to Botany. Lecture 14

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Outline

1 Questions and answers

- Leaf morphology

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1 Questions and answers

2 Leaf

- Leaf morphology

Previous final question: the answer

What are tubers?
(give a short definition)

Previous final question: the answer

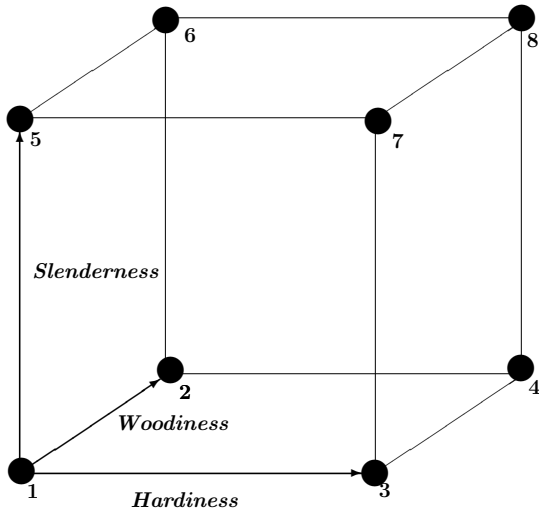
What are tubers?
(give a short definition)

- Enlarged parts of rhizomes (underground stems), e.g., in potato

Life forms: dynamic approach

- **Hardiness:** sensitivity to all negative influence
- **Woodiness:** % of cells with secondary walls
- **Slenderness:** proportion of vertically ordered stems

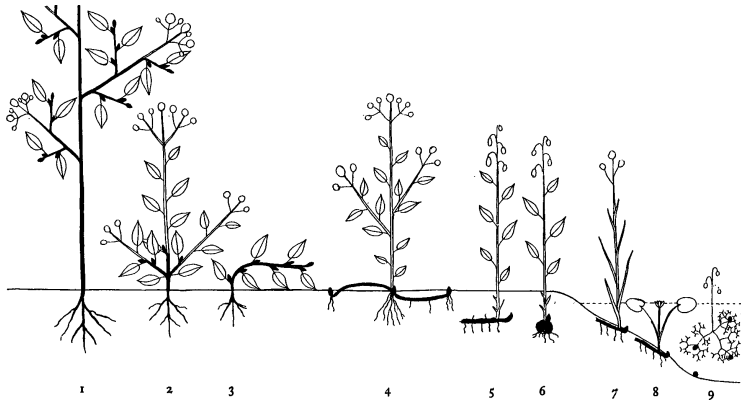
Life form cube



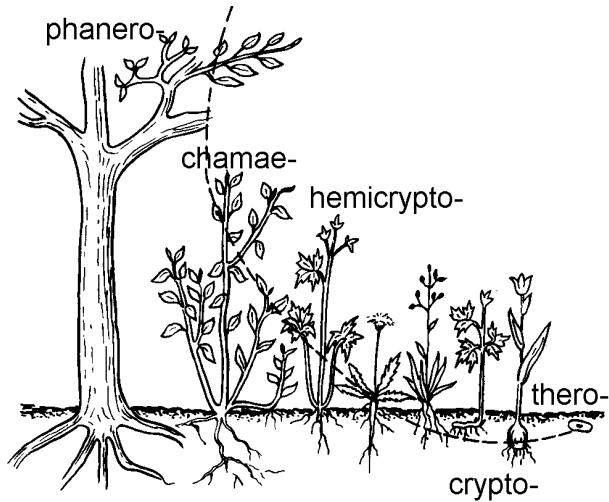
Life forms: Raunkiaer's approach

- **Phanerophytes**: winter buds openly exposed
- **Chamaephytes**: winter buds under snow
- **Hemicryptophytes**: winter buds on soil surface
- **Cryptophytes**: winter buds in the soil
- **Therophytes**: no winter buds, only seeds

Raunkiaer classification (after Raunkiaer, 1937)



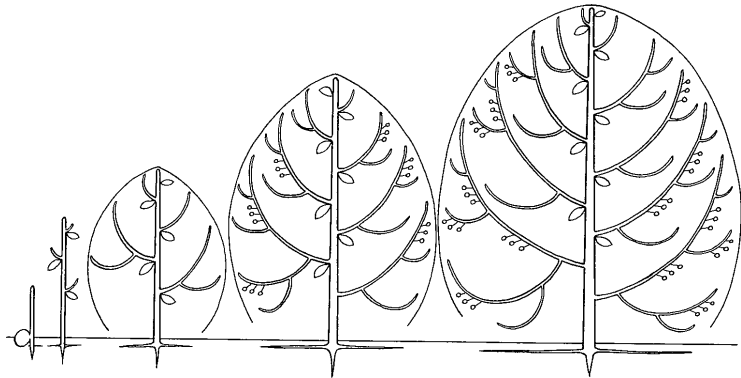
Raunkiaer classification again



Life forms: architectural models

- Developed for tropical trees, but also cover temperate forms which are less diverse
- Each model has a name of famous botanist, e.g. Thomlinson, Cook, Attims
- Based on the character of branching, development of generative shoots, directions of growing

Example of architectural model: Attims

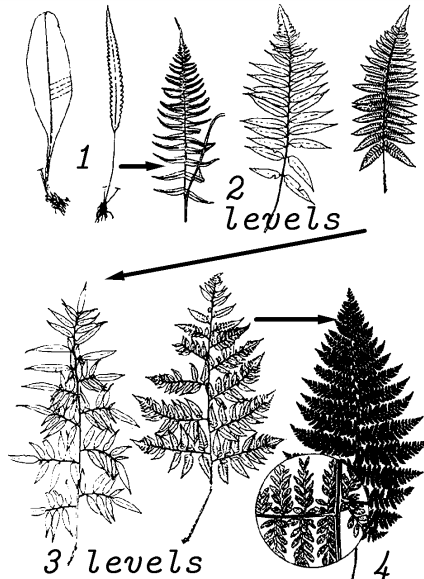


Many temperate trees are growing according to this model

Definition, functions and features

- Lateral flattened organ of shoot with restricted growth
- Functions:
 - Photosynthesis
 - Respiration
 - Transpiration
 - Synthesis of secondary chemicals
- Features:
 - Have bud in the axil
 - Do not grow by apex
 - Do not produce new leaves
 - Have hierarchical morphology

Hierarchical levels in leaf morphology



Types of leaf characters

- General: applicable only to the whole leaf
- Terminal: applicable only to the terminals (e.g., terminal leaflets)
- Repetitive: repeating on each level of hierarchy

Hierarchy in leaf morphology

- General and terminal characters do not depend on hierarchy
- Repetitive characters may be different on each step of hierarchy
- Therefore, leaf description should state that “on first level of segmentation, the form is ..., on the second level, the form is ...”
- It is possible that each level has different repetitive characters

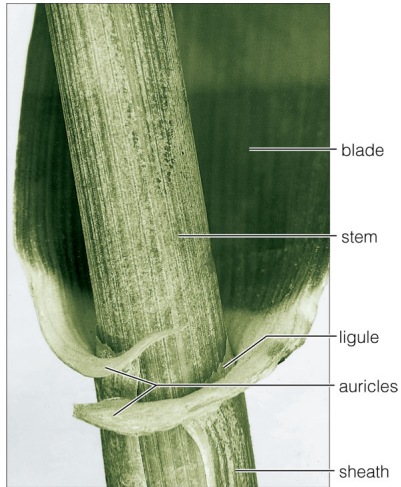
General characters

- General characters apply to the whole leaf
- Stipules (present or not, how many etc.)
- Other leaf base organs (sheath, ocrea, ligules etc.)

Stipules



Leaf base



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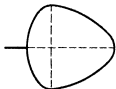
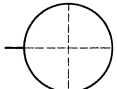
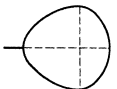

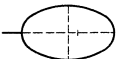
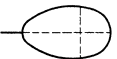

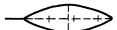


Repetitive characters

Repetitive characters are the same on each level of leaf hierarchy:



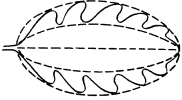


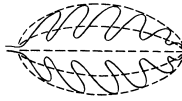


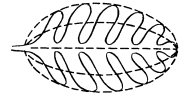

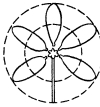
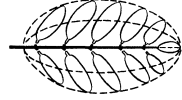
- Form
- Dissection
- Petiole (stalked/non-stalked etc.)

Repetitive characters of same type may combine

Form

	Maximum width closer to leaf base	Maximum width in the middle	Maximum width closer to the apex
Length = width or slightly more	 Deltate	 Elliptic	 Cuneate
Length > 1-1.5 x width	 Ovate	 Oblong	 Obovate
Length > 3-4 x width	 Narrowly ovate	 Lanceolate	 Narrowly obovate
Length > 5 x width	 Linear		

Dissection

		Tri-	Palmately	Pinnately
Simple leaves	Lobed (from 1/4 to 3/4)			
				
	Dissected (from 3/4 to midrib)			
Complex leaves (leaflets stalked, with joints)				

Summary

- Life forms classifications are based primarily on characteristics of shoot
- Leaves have **general**, **repetitive** and **terminal** characters

Final question (2 points)

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How many levels of hierarchy has this leaf?



For Further Reading



J. E. Bidlack, Sh. H. Jansky.
Stern's introductory plant biology. 12th edition.
McGraw-Hill, 2011.
Chapter 7.



Th. L. Rost, M. G. Barbour, C. R. Stocking, T. M. Murphy.
Plant Biology. 2nd edition.
Thomson Brooks/Cole, 2006.
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